

## User Manual

### SR100i....485

**No-Break DC UPS - with RS485 serial port  
100W**



MODBUS protocol converter (ordered separately)

## **Safety**

The user is responsible for ensuring that input and output wiring segregation complies with local standards and that in the use of the equipment, access is confined to operators and service personnel. A low resistance earth connection is essential to ensure safety and additionally, satisfactory EMI suppression (see below).

**HAZARDOUS VOLTAGES EXIST WITHIN A POWER SUPPLY ENCLOSURE AND ANY REPAIRS MUST BE CARRIED OUT BY A QUALIFIED SERVICEPERSON.**

## **Electrical Strength Tests**

Components within the power supply responsible for providing the safety barrier between input and output are constructed to provide electrical isolation as required by the relevant standard. However EMI filtering components could be damaged as result of excessively long high voltage tests between input, output and ground. Please contact our technicians for advice regarding electric strength tests.

## **Earth Leakage**

The EMI suppression circuits causes earth leakage currents which may be to the maximum allowable of 3.5mA.

## **Ventilation**

High operating temperature is a major cause of power supply failures, for example it has been well documented that a 10°C rise in the operating temperature of a component will halve its expected life. Therefore always ensure that there is adequate ventilation for the equipment. Batteries and cooling fans also suffer shortened lifetimes if subjected to high ambient temperatures - both should be included in a routine maintenance schedule to check for signs of reduced efficiency.

## **Water / Dust**

Every effort must be made in the installation to minimise the risk of ingress of water or dust. Water will almost always cause instant failure. The effects of dust are slower in causing failure of electronic equipment but all electrical equipment should be cleaned free of any dust accumulation at regular intervals. This is particularly important where internal fans are fitted.

## **Electromagnetic Interference (EMI)**

Switching power supplies and converters inherently generate electrical noise. All wiring should be as short as practicable and segregated from all other equipment wiring which is sensitive to EMI. Residual noise can be reduced by looping DC wiring through ferrite cable sleeves. These are most effective as close to the power supply as possible and as many turns of the wire taken through the core (+ and - in the same direction) as the core will accommodate.

## **Fuse ratings**

Check that the wiring and fuses or MCBs match the rating of the PSU or converter. Adequate fuse protection of battery circuits is very important owing to the large potential currents available from batteries.

## **Connection polarity**

It is critical to check the polarity carefully when connecting DC power supplies and chargers to equipment. Boost chargers and some float chargers usually have reverse polarity protection (RPP), which can be electronic (non-destructive) or by an internal fuse which needs to be replaced if a battery is connected in reverse.

## **Glossary of terms used in our user manuals**

**PSU** = power supply unit

**BCT** = battery condition test

**ECB** = electronic circuit breaker

**ELVD** = electronic low voltage disconnect

**RPP** = reverse polarity protection

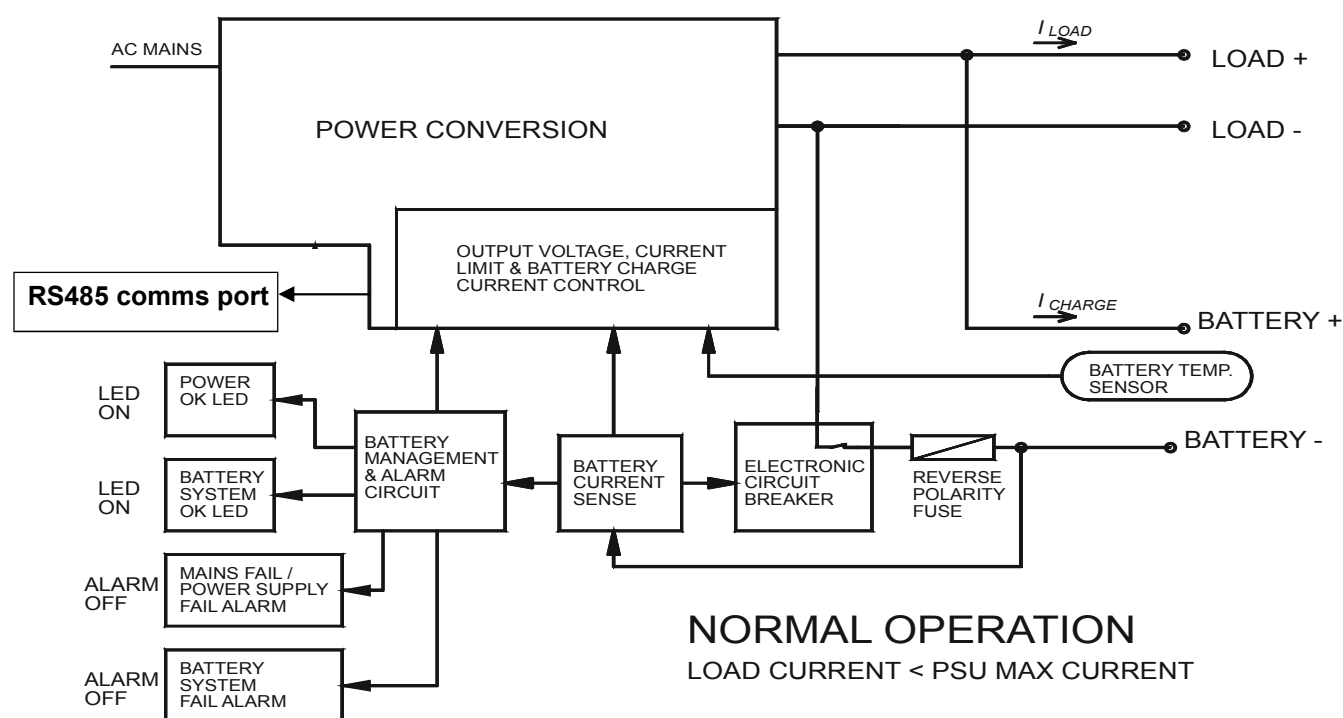
**EMI** = electromagnetic interference

**SNMP** = Simple Network Management Protocol

**LAN** = local area network

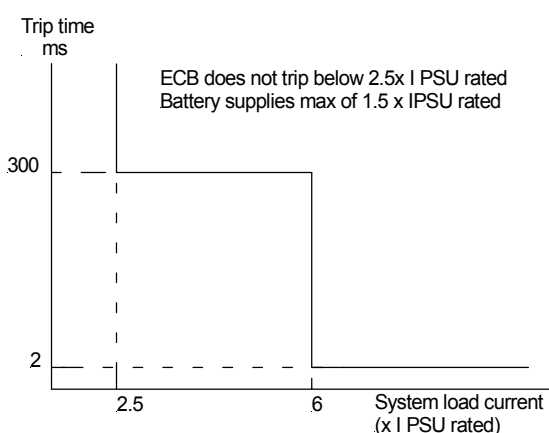
The **No-Break™ DC** power supply is designed to provide DC power to lead acid batteries for critical back up applications. In addition to the normal features of the standard **SR100C..** model, the **SR100i....-485** has an RS485 communication interface normally for use with a MODBUS protocol converter to enable user monitoring of the power supply and battery parameters and control of the battery condition test function.

## No-Break™ SYSTEM BLOCK DIAGRAM

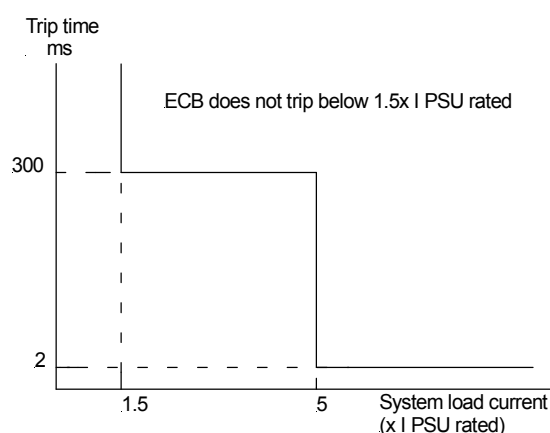


## OPERATION OF ELECTRONIC CIRCUIT BREAKER (ECB)

**Input power on**



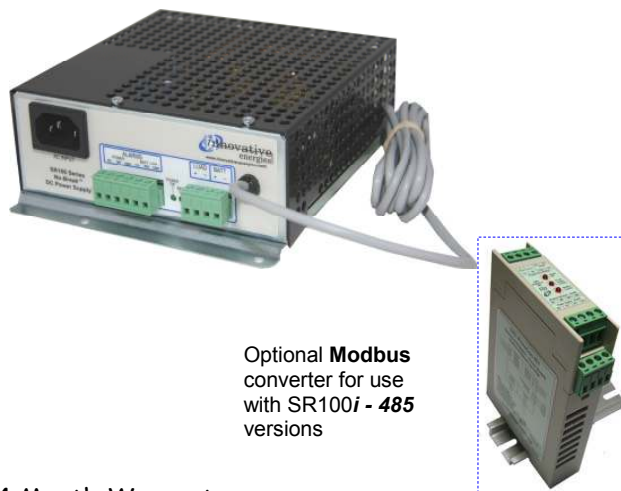
**Input power off**



The ECB is activated under the following conditions:

1. battery voltage drops below the  $V_{disco}$  (1.66V/cell)
2. battery current overload (refer to graphs above)

The ECB will latch open only when there is no input power present. It will reset when input power is restored or can be manually reset by briefly shorting the **BAT-** and **LOAD-** terminals together when there is no input power.



♦ 24 Month Warranty

- High performance **No-Break™** DC UPS system
- Separate outputs for load and battery
- Battery detection - regular battery presence and battery circuit integrity checks
- Battery deep discharge protection
- ECB for battery overload & short circuit protection
- Fused reverse battery polarity protection
- Automatic temperature compensated output volts
- Low battery voltage alarm on mains fail
- Power (mains fail) alarm
- No transition switching to backup battery
- LED flash codes for precise fault indication
- High efficiency switch mode design
- Suitable for use with all types of lead acid batteries (batteries external to power supply)

**SPECIFICATIONS** All specifications are typical at nominal input, full load and at 20°C unless otherwise stated.

## ELECTRICAL

<b>Input Voltages</b>	
▪ standard	180V - 264VAC 45-65Hz
▪ optional	88V- 132VAC 45-65Hz,
<b>Fusing / Protection</b>	Input fuse & varistor Output fuse, ECB for battery circuit
<b>Isolation</b>	1KV DC input - output / earth
<b>Efficiency</b>	≥ 85%
<b>Inrush current</b>	<30A, 1.8ms
<b>Output Power</b>	100W
<b>Output Voltages</b>	13.8, 27.6, 34.5, 41.4, 55.2VDC
<b>Voltage adj. range</b>	85 - 105% of Vout
<b>Temp. Compensation</b>	Temperature sensor on 1.7m lead with adhesive pad: -4mV / °C / cell ±10%
<b>Current Limit</b>	<b>PSU:</b> 100% rated current <b>Battery:</b> 25-100% PSU current
<b>Line Regulation</b>	<0.04% over AC input range
<b>Load Regulation</b>	<0.5% open circuit to 100% load
<b>Noise</b>	<0.3%
<b>Transient response</b>	200mV over / undershoot, load step 20-100%, 400us settling time
<b>Thermal Protection</b>	Yes, self-resetting
<b>Hold-up time</b>	15 - 20 ms (nom. - max. Vin) without battery

## STANDARDS

<b>EMI</b>	to CISPR 22 / EN55022 class A
<b>Safety</b>	to IEC950 / EN60950 / AS/NZS3260

## No-Break™ FUNCTIONS AND ALARMS

<b>Battery Charge Current Limit</b>	100% of PSU rated current unless specified on ordering
<b>Reverse Polarity</b>	Battery reverse connection will open internal fuse (and produce alarm)
<b>Battery Monitoring</b>	Detects for presence of battery on start up, then every 60 minutes when charge current < 200mA
<b>Battery Protection</b>	Electronic circuit breaker (ECB) operates under the following conditions:
- low battery volts	<ul style="list-style-type: none"> <li>• battery voltage drops to 1.67V/cell - auto reset</li> </ul>
- overload	<ul style="list-style-type: none"> <li>• &lt; 300ms for load &gt; 6 x rated PSU current, allows ~1.5x rated PSU current from battery without acting,</li> </ul>
- short circuit	<ul style="list-style-type: none"> <li>• &lt; 2ms, backed up by fuse</li> </ul>
<b>LED Indication</b>	Green: Power OK Green: Battery OK
<b>Alarms</b>	<ul style="list-style-type: none"> <li>• Power OK (Mains/PSU fail)</li> <li>• Battery System OK - alarms when battery voltage low (on mains fail), battery missing, battery circuit wiring faulty, BCT fail (if enabled)</li> </ul>
<b>Alarm relay contacts</b>	C - NO - NC full changeover rated 30VDC, 2A / 110VDC, 0.3A/125VAC, 0.5A
<b>Battery Condition Test (BCT)</b>	Standard on SR100i

## PHYSICAL

<b>AC Input connector</b>	IEC320 input socket (similar to PCs etc.)
<b>DC Connections</b>	Plug-in style socket & mating screw terminal block: (max. wire 2.5mm <sup>2</sup> / way)
<b>Alarm Connections</b>	Plug in screw terminal block
<b>Enclosure</b>	Zinc plated & powder coated steel
<b>Dimensions</b>	147W x 177D x 62H mm
<b>Weight</b>	0.95 Kg

# 100 Watt No-Break™ DC UPS with comms. interface

# SR100i

## STANDARD MODEL TABLE

MODELS	DC Output				
	Output (V)	PSU Rated (A)	Charge Limit (A) *1	Recomm. Load (A)	Peak load on power fail (A)
SR100i 12	13.8	7.5	7.5	6.0	11
SR100i 24	27.6	3.7	3.7	3.0	5.5
SR100i 30	34.5	2.9	2.9	2.3	4.3
SR100i 36	41.4	2.4	2.4	1.9	3.6
SR100i 48	55.2	1.9	1.9	1.5	2.8



SR100i with RS485 serial port

## ENVIRONMENTAL

Operating temperature	0 - 50 °C ambient at full load De-rate linearly >50 °C to no load @ 70 °C
Storage temperature	-10 to 85 °C ambient
Humidity	0 - 95% relative humidity non-condensing

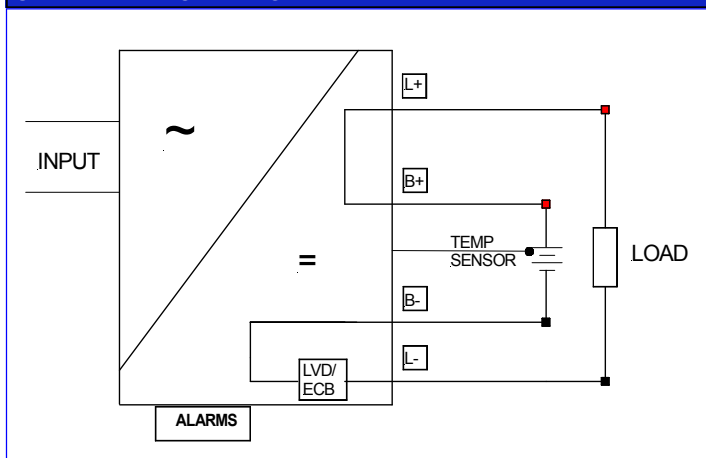
## ACCESSORIES SUPPLIED

Mounting feet together with screws  
AC power cord 1.5m with IEC320 socket & AUS/NZ plug  
Mating screw terminal plug for DC output  
Mating screw terminal plug for alarms

## OPTIONS

<b>Battery Condition Test</b>	BCT jumper may be fitted to automatically enable BCT on startup
<b>Communication Port</b>	Choice of RS485, RS232, LAN+ (SNMP), LAN (ASCII)
<b>Modbus converter</b>	For SR100i ... 485, use protocol converter, with programming port for PC. <b>Power MBLink</b> setup software supplied. add <b>+PROTOCONMB</b> or add <b>+PROTOCONMB-OE</b> with ethernet port
<b>Parallel Redundancy</b>	2 x SR100i units may be connected in parallel for redundancy
*1 <b>Charge current limit</b>	25% & 50% settings available

## SCHEMATIC BLOCK DIAGRAM



## CABINET OPTIONS

<b>19" Rack Mount</b>	2U sub rack option: add <b>SR-RM2U</b> Optional V/I meter for subrack: <b>SR-METER</b>
<b>Wall Mount Enclosure</b>	PSU may be fitted into enclosure with MCBs and terminals: add <b>SEC-SR</b>

## MODEL CODING AND SELECTION CHART

# SR100 i 12 T X G-485

Optional Communications Interface Port    **485** = RS485    **232** = RS232    **LAN** = Ethernet (ASCII)  
**LAN+** = Ethernet (SNMP)

Input voltage and front panel standby switch

Output DC connector

Temperature Compensation

DC output (nominal battery voltage)

Function

Power

Blank = 230V AC no switch  
**G** = 110V AC no switch  
**J** = 99-180V DC no switch

**X** = Plug in /screw terminal block

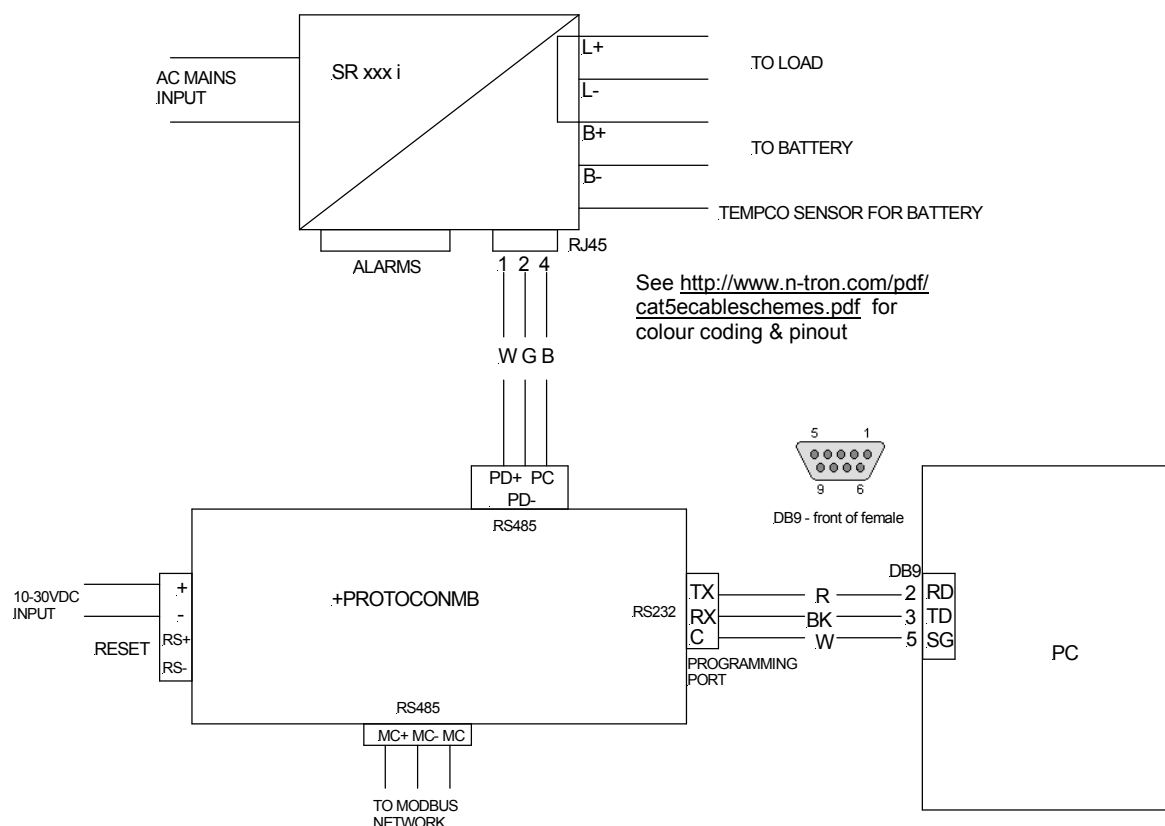
**T** = Yes

Blank = No

**12, 24, 30, 36, 48V**

**100W**

## CONNECTION DIAGRAM



## CONNECTION & INITIAL TESTING

- 1 Check input and output voltages of system, ensure that they match the equipment. All loads should be isolated.
- 2 Check polarity of all wiring. Place temperature sensor probe near or on batteries.
- 3 Plug in ac input and turn power on. Both LEDs will light up after approx. 4 sec, "BATTERY" LED will go out after another 10 sec (since there is no battery connected). DC output voltage should appear at both load and battery outputs (ensure screws are tightened down on the connector block).
- 4 Turn off input power.
- 5 Connect battery.
- 6 Check that ELCB (internal electronic circuit breaker) closes by shorting together the **BATTERY -ve** and **LOAD -ve** terminals briefly. You will hear a relay operate and both LEDs will light up. If this does not happen, there is a fault in the wiring or the internal battery protection fuse is ruptured (see Note 2 below). The battery voltage will then appear at the load terminals and the "BATT" alarm relay energises. The "POWER" LED stays on for about 30 seconds.
- 7 Connect load wiring to **LOAD+** and **LOAD-** terminals.
- 8 Turn on ac power.
- 9 After the batteries are fully charged, check that the battery continues to power up the load when the input power is turned off.
- 10 Connect power (10-30VDC) to the protocol converter, the red LED ("supply on") will light up
- 11 Connect RS485 communication port on SRxxx i to MODBUS protocol converter (+PROTOCONMB). The green LEDs on both the power supply and the converter will flash to indicate that the comms. are working.
- 12 Connect the programming cable between the converter and your PC. It is better to use a computer with a DB9 serial input as some serial to USB converters do not work. For instructions on the protocol converter please refer to page 10.

## NOTES

### 1 Fuse Ratings

The battery fuse and wiring should be rated at 1.5 x the rated PSU current.

The complete system is capable of delivering 2.5 x rated PSU current to the load and all load cabling should be rated for this current.

### 2 Reverse polarity protection

If the battery is connected in reverse, the internal battery protection fuse may be ruptured and the unit should be returned to the manufacturer for repair. If the fuse is good, the voltage measured as at step 3 above should be exactly the same on both the load and battery outputs.

### 3 Battery Condition Test (BCT) Fail Reset

If the system fails a battery condition test the **BATT LOW** alarm latches (de-energized state) until either: both the mains power input and the battery are disconnected briefly or: the system passes the next BCT.

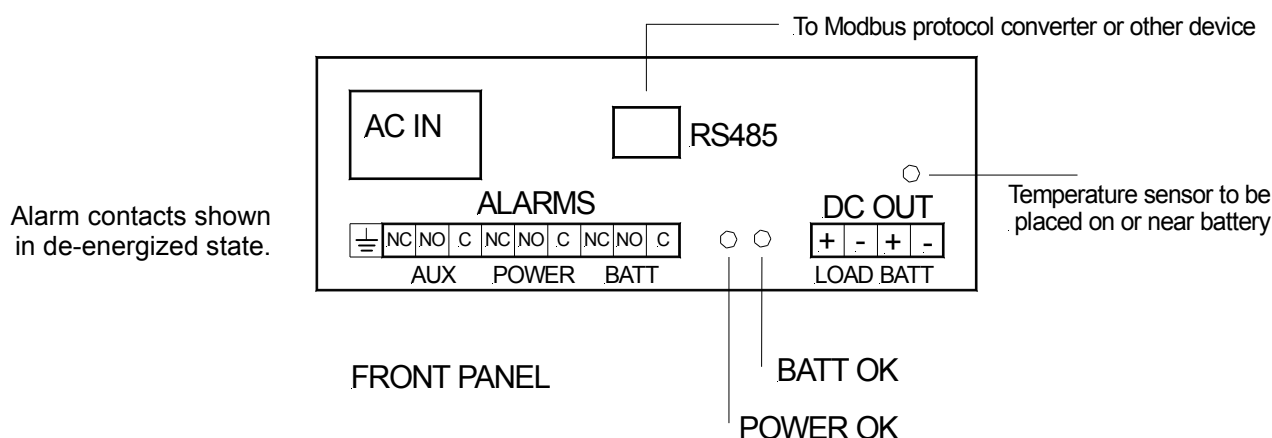
## BATTERY CONDITION TEST

The BCT may be enabled or disabled by the user via the communication port or it may be enabled by an internal jumper as supplied from factory. Unless this jumper has been requested at the time of ordering then it is not fitted as standard. Refer to the photo to the right for the position of this jumper.

**Note:** If the jumper is not fitted and the charger is disconnected from both the mains input and the battery, or there is a low voltage disconnect, then the BCT will be disabled until reprogrammed.



## ALARM CONNECTIONS



## ALARMS

### POWER:

De-energized on loss of mains input power

**NOTE:** 30 second delay

### BATT:

















De-energized when either:

1. battery voltage = 1.8V/cell (for 2V cells) - operates only when no mains power present or
2. battery missing or fault in battery circuit wiring (alarm does not activate for up to battery detection interval time).

### AUX:

This relay is energized when BCT is in progress unless otherwise specified

## LED INDICATION

Power OK LED	Battery OK LED	Power Alarm	Battery Low Alarm	Condition
		Normal	Normal	<b>System Normal:</b> AC power is on, PSU output is OK, battery circuit is OK and battery voltage is > V Battery Low.
		Normal	Normal	Battery detection test imminent (LED begins flashing prior to test ).
		Normal	Alarm	System AC power is on, PSU output is OK but either: 1. Internal battery fuse has opened (only if battery has been reverse polarity connected), <b>or</b> 2. Battery circuit open - battery missing, or fuse / circuit breaker / wiring fault.
		Alarm	Normal	Either AC power has failed, <b>or</b> PSU has failed. Battery system is OK
		Alarm	Alarm	AC Power is off / DC has failed <b>and</b> battery has discharged to $\leq$ V Battery Low, unit will continue delivering battery current until low level initiates ELVD.
		Alarm	Alarm	AC Power is off / DC has failed <b>and</b> ELVD has activated and disconnected battery from load. Residual current drain on battery following ELVD <1 mA.
		Normal	Normal	Battery Condition Test is in progress: LEDs flash alternately
		Normal	Alarm	Battery Condition Unserviceable: failed to maintain terminal voltage during battery condition test

### LEGEND :



=On



=Flashing



=Flashing Slowly



=Off

## INFORMATION AVAILABLE VIA +PROTOCONMB (MODBUS converter)

### Continuously Updated Variables:

- Output Voltage
- Battery Current
- Power Supply Current
- Battery Temperature

### Alarms

- Mains Failure
- Possible Mains/PSU Fail
- Battery in Bad Condition
- Communications to PSU Fail (eg. on LV disconnect)
- Overload
- System Down
- Battery Missing
- Battery Low
- Possible Battery Missing

### Alarm State Signals:

- Normal Operation
- Battery Present
- Battery OK (on input power fail)
- Battery Charging
- Battery Condition Test
- BCT enabled
- Retry BCT on fail
- Battery Discharging
- Battery in Good Condition

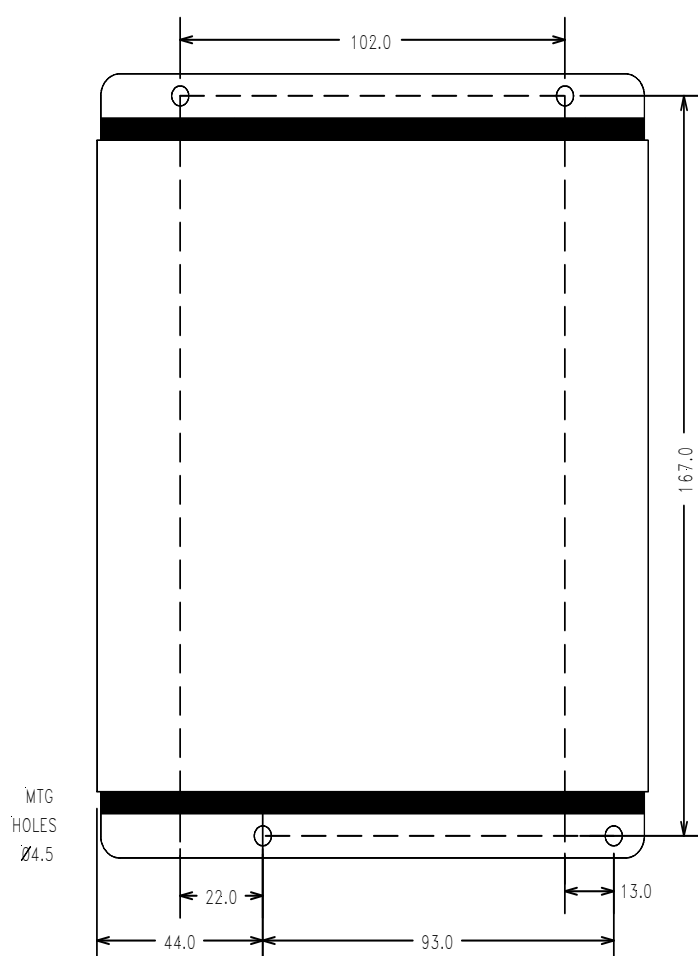
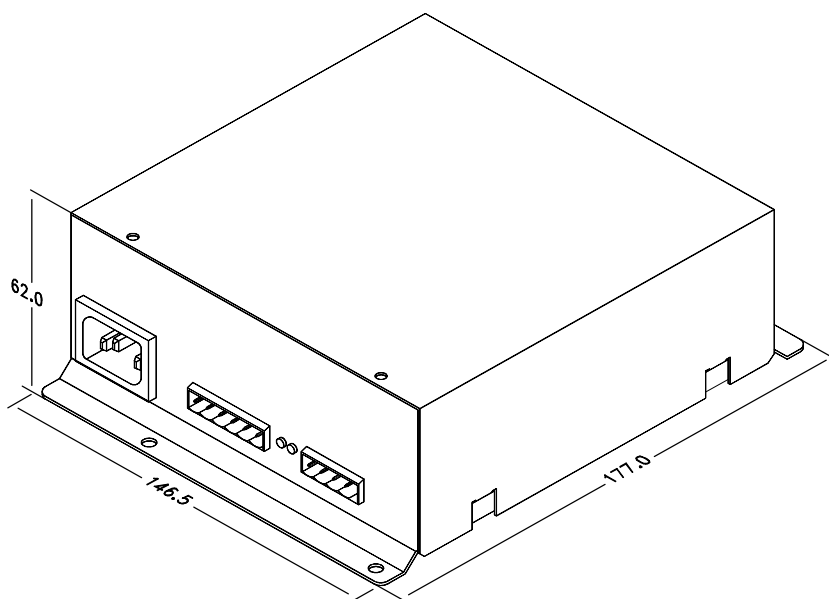
### Command Functions:

- BCT Enable Acknowledge
- BCT Disable Acknowledge
- BCT Start Acknowledge
- BCT Stop Acknowledge

## Default Settings (at 20°C)

Parameter	Nominal Voltage					Default Value
	12V	24V	30V	36V	48V	
<b>V out</b> = Output Voltage	13.8	27.6	34.5	41.4	55.2	2.3V/cell
<b>V pres</b> = Voltage threshold for battery detection & battery condition test (BCT). If voltage drops to this level during BCT then the test is aborted and <b>BATT SYS OK</b> alarm activated. .	12.2	24.4	30.5	36.6	48.8	2.03V/cell
<b>V shutd</b> = Output voltage of PSU during battery detection & BCT	11.5	23	28.8	34.5	46	1.92V/cell
<b>V batl</b> = voltage where BATT low alarm activates during mains fail	11	22	27.6	33	44	1.84V/cell
<b>V disco</b> = Battery disconnect level on low voltage during mains fail	10	20	25	30	40	1.66V/cell
<b>Bccl</b> = Maximum charge current as % of rated PSU rated current						100%
<b>Comms</b> = communications mode of PSU: F = continuous data stream of status M = responds only to request made by a controller						M
<b>BatDetect</b> = Battery detection interval time, active only when no battery charge current is detected (the unit may not detect a missing battery for up to this time)						60 min
<b>BCT</b> = length of battery condition test						20 min
<b>Ret</b> = retest option: N = after a failed BCT further scheduled BCTs are inhibited Y = after a failed BCT further scheduled BCTs will be allowed						Y
<b>CC</b> = Length of charge cycle in minutes/hours/days. ie. time between battery condition tests						40m/23h/ 027d
<b>MfiBCT</b> = time before mains fail check during BCT. A mains fail during a BCT will stop the BCT. If set longer than BCT time no mains fail check will occur.						030 min

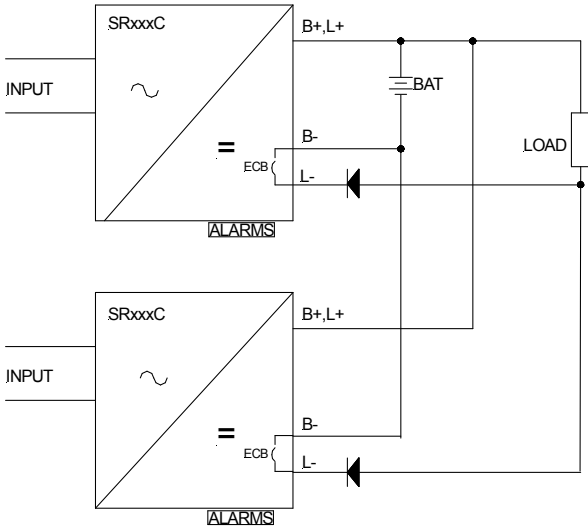
## SR100



No-Break DC connections for N+1 redundancy & peak loads

#1 N+1 for No-Break™DC charger and single battery bank

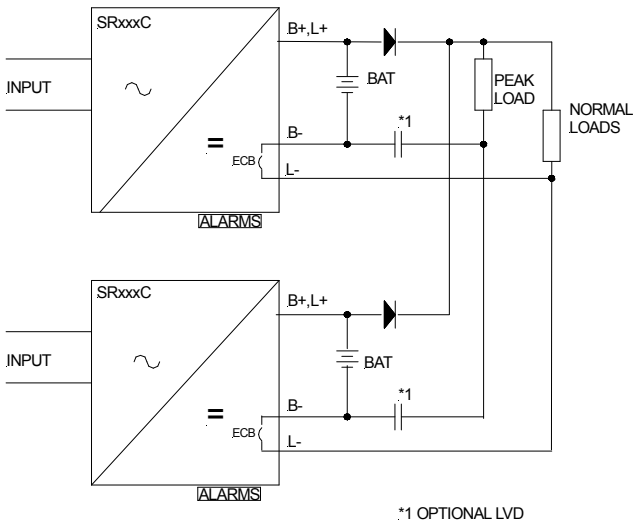
This connection provides for redundancy of the charger and retains most of the No-Break functions.



Alarms available	
Power OK	YES
Battery missing	NO
Battery low	YES
Battery condition test fail*1	YES

#2 N+1 for No-Break™DC charger and N+1 for battery bank (use this connection for high peak loads)

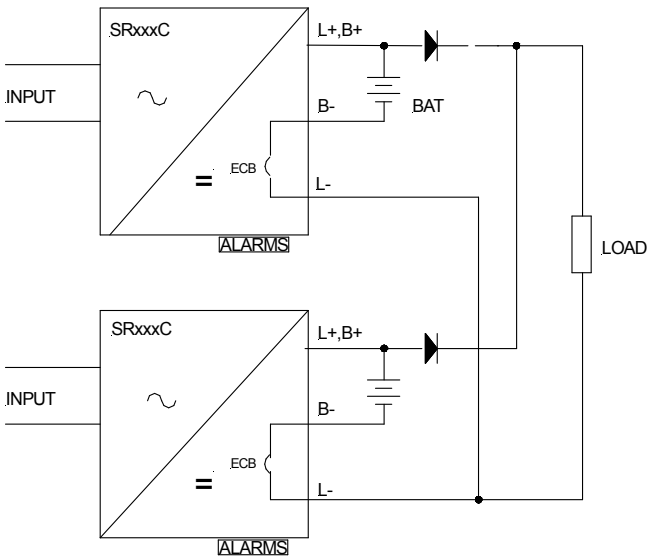
All No-Break alarms are available and the low voltage disconnect for the peak load is optionally implemented with an external relay.



Alarms available	
Power OK	YES
Battery missing	YES
Battery low	YES
Battery condition test fail*1	YES

#3 2 x No-Break™DC chargers and 2 x battery banks

2 x No-Break™DC chargers connected in parallel with separate battery banks & output diodes. This solution provides an extremely high level of redundancy for very critical applications, with redundancy of the battery in addition to the power supply. The diodes isolate the units from one another in the event of a short circuit appearing at the other output and aid current sharing.

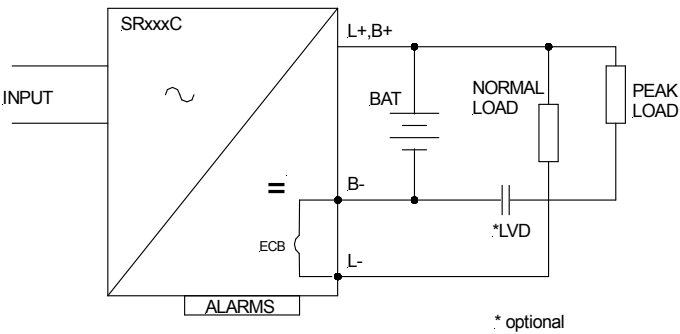


Alarms Available	
Power OK	YES
Battery Missing	YES
Battery Low	YES
Battery Condition Test Fail*1	YES

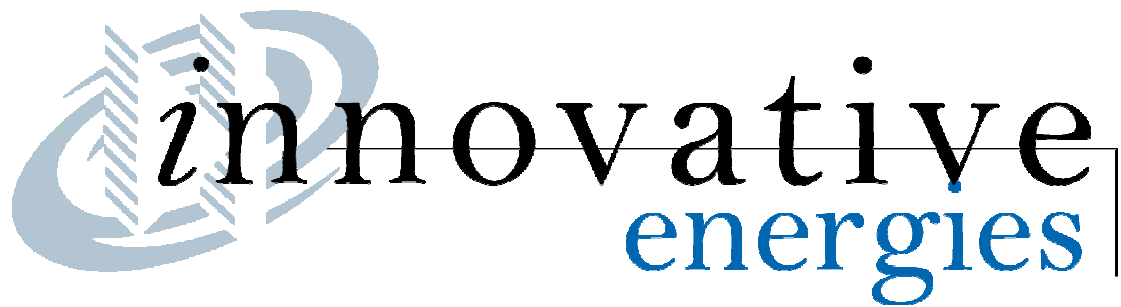
\*1 interlock circuit required for automated BCT

#4 1 x No-Break™DC Connection for high peak loads

This is a basic connection which is used when there is a connected load with a peak current greater than 1.5 times the rated current of the charger. Standing loads are connected normally and an optional external low voltage disconnect may be used for the peak load.



Alarms Available	
Power OK	YES
Battery Missing	YES
Battery Low	YES
Battery Condition Test Fail	YES



#### TERMS OF WARRANTY

Innovative Energies Ltd warrants its power supplies for 24 months (two years) from date of shipment against material and workmanship defects.

Innovative Energies' liability under this warranty is limited to the replacement or repair of the defective product as long as the product has not been damaged through misapplication, negligence, or unauthorized modification or repair.

Thank you for purchasing from Innovative Energies.

We trust your power supply will exceed your expectations and perform for years to follow.

Sincerely,  
The Innovative Energies team.

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